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## PREWAR AND PRESENT REPRODUCTION COSTS OF WATER WORKS<sup>1</sup>

By L. R. Howson<sup>2</sup>

Anyone who has had occasion to purchase water works construction materials at reasonably frequent intervals in the past five years has been impressed with the almost continuous upward trend of prices for those materials, along with practically all other commodities. We all know, in a general way, that cast iron pipe, which, prior to the war, varied in price from \$25 to \$35 per ton, is now costing from \$70 to \$75 per ton; that brick, formerly \$6.50 per thousand, now costs \$14, and that labor, formerly plentiful and efficient at 20 cents per hour, is now getting from 40 to 45 cents per hour, and is less efficient than formerly. Probably few of us, however, have had occasion to investigate the effect of these increased unit costs upon the total cost of constructing or of reproducing complete water works properties, and it is to throw some light on this question that this paper is prepared.

Prior to the war, the most commonly used measure of value in appraising water works properties was the estimated cost to rebuild, or reproduction, using as a basis for the estimate of future prices the average of the prices which prevailed during, say, the five-year period prior to the date of valuation. Obviously, reproduction is a rebuilding process of the immediate future, and the prices used involve a forecast of future prices and construction conditions just as they do in all normal engineering construction. However, in normal times, prior to the war, materials fluctuated in a series of cycles, with a gradually rising trend, and a very good idea of the near future prices was therefore possible by a study of the prices of the five-year period preceding.

Within the last five years, however, construction prices and conditions have changed, and the question now arises as to where the

<sup>1</sup> Read before the Illinois Section, March 25, 1920. Discussions of this paper are requested and should be sent to the Editor.

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reproduction costs of the future will probably lie. On several recent Boards of Arbitration, selected to fix the value of water works properties, two estimated costs of reproduction have been made; one on a prewar basis of unit prices, and the second on the basis of present day prices, and the value reasoned from these limiting estimates.

There are few well-informed people who will contend that prewar prices will ever again prevail in our time, and, accordingly, a cost of reproduction, using prewar prices, represents in all probability a minimum measure of the value of the property.

TABLE 1  
*Average prices for water works materials 1910-1920*

MATERIAL	YEARS									
	1910	1911	1912	1913	1914	1915	1916	1917	1918	1919
Cast iron pipe										
6-inch F.O.B. Chicago.....	\$26.92	\$24.11	\$26.17	\$26.83	\$24.21	\$24.54	\$31.25	\$54.90	\$57.85	\$57.97
6-inch valves.....	12.50	12.50	12.50	12.50	12.50	12.50	16.50	19.50	21.00	22.50
2 nozzle hydrants.....	25.00	25.00	25.00	25.00	25.00	25.00	34.50	41.50	49.50	49.50
1/4-inch Empire meters	10.40	10.40	10.40	10.40	10.40	13.25	14.10	14.10	14.10	14.10
Cross compound pumps per million gallons capacity.....	3000.00	2700.00	2500.00	2500.00	2500.00	2500.00	3300.00	7500.00	7500.00	7500.00
Lumber—dealer's price.....	26.00	26.00	26.00	26.00	24.00	28.00	28.00	40.00	43.00	58.00
Cement (net).....	1.25	1.25	1.25	1.25	1.15	1.15	1.43	1.78	2.00	2.00
Brick (Chicago).....	6.50	6.50	6.50	6.50	6.50	7.00	7.00	9.00	12.00	14.00
Steel bars.....	11¢	11¢	11¢	2.1¢	1.9¢	1.9¢	3.5¢	6.4¢	4½¢	4¢
Common labor, Central Illinois.....	20¢	20¢	22¢	22¢	22¢	22¢	25¢	28¢	35¢	40¢
Teams.....	40¢	40¢	40¢	40¢	45¢	50¢	60¢	70¢	75¢	80¢

Most appraisers are also of the opinion that the crest of prices has been nearly or quite reached, and that, beginning soon, there will be a slow and gradual recession in prices to some new level intermediate between the prewar and the present. Accordingly, a reproduction estimate made, using the present price basis, represents approximately the maximum value of the property to those who hold this opinion.

In table 1 are shown the average prices of the more important water works construction materials which prevailed during each of the years from 1909 to the present. This table simply shows facts, with which most of us are more or less familiar.

Table 2 shows the results of cost-of-reproduction estimates made for six water works properties during the past year on both the pre-war and the present price bases, and illustrates the effect of the fluctuation in unit prices on the total cost of reproducing the property.

In the ordinary water works property from 50 to 75 per cent of the total value lies in the distribution system, and, for this reason, the author has shown in the fourth column of table 2 the relative proportion of the distribution system cost to the entire plant cost, both based on prewar units. The distribution system materials have increased in relatively greater proportion than have other

TABLE 2  
*Comparative pre-war and present reproduction cost of waterworks*

PLANT	POPULATION SERVED	TONS OF CAST IRON PIPE PER 1000 POPULATION	PER CENT DISTRIBUTION SYSTEM OF TOTAL COST TO REPRODUCE, PRE-WAR	COSTS OF REPRODUCTION				EXCESS PRESENT OVER PRE-WAR
				Pre-war		Present		
				Cost of pipe per ton	Total	Cost of pipe per ton	Total	
			<i>per cent</i>					<i>per cent</i>
A	92,000	245	58½	\$27.10	\$3,700,000	\$63.00	\$6,400,000	73
B	8,500	217	79	29.00	280,000	57.05	503,000	80
C	10,000	286	61	28.00	264,000	55.00	444,000	68
D	12,000	294	77	28.00	394,000	59.50	689,000	75
E	25,000	170	66½	27.10	632,000	68.00	1,192,000	89
F	25,000	179	46	27.50	761,000	52.80	1,242,000	63

With pipe at present price (\$66 Birmingham) percentages in last column would be raised to, 78 per cent for A; 91 per cent for B; 87 per cent for C; 86 per cent for D; 91 per cent for E; 74 per cent for F.

water works materials, and, accordingly, the greater the proportion which the distribution system is of the entire property the greater will be the cost of reproduction at present prices as compared to prewar prices.

The data in this table show that:

1. For a property in which approximately 50 per cent of the total value prior to the war was in the distribution system, the cost of reproduction at the present time would be approximately 75 per cent above prewar.
2. For a property in which approximately 75 per cent of the value was in the distribution system prior to the war, the present cost of reproduction would be approximately double that of the prewar.

Subsequent to the making of these reproduction estimates, the costs of lumber, millwork and some other materials have risen, which would tend to increase these percentages slightly.

*Consideration of increased costs necessary in valuation.* In using reproduction estimates to reason out the valuation of utility properties, several fundamental requirements must be complied with. Among them are:

1. The kind of service afforded by the utility must be needed by the public in the future.
2. The utility being valued must be capable of supplying the service desired, economically, for the present, and be capable of economical enlargement to supply for the future.
3. The service must be supplied by the utility at a lower cost than that at which the individual could supply himself with equivalent service.
4. The public need for the utility in the near future must be a stationary or increasing demand, and not a decreasing one.

When these fundamental conditions are satisfied, a cost of reproduction estimate, carefully made, using the reproduction conditions and prices which will probably prevail during the period of rebuilding and as well continued over a reasonable future period, for which the rates are to be in practicable effect, furnishes the best index or measure of the future value of the property, and it is to be noticed that it is the future value that we want to know. There is undoubtedly much difference of opinion as to just where the prices of the next few years will fall; however, there cannot be much disagreement with the statement that they will lie somewhere between the prewar normal and the present prices, and the consensus of opinion seems to be that they will lie closer to the present prices than the prewar prices for a considerable time to come.

### DISCUSSION

Dow R. GWINN: It is interesting, in connection with what the author has just told us, that the United States Supreme Court has recently rendered a decision in connection with the valuation of railroad property in which it was stated that the present cost of reproduction should be taken into consideration. The speaker hoped that the decision would be even more pronounced and that it would provide that the present cost of reproduction should prevail to a considerable extent.

It will be interesting to note just how much consideration the State Public Utilities Commissions will give to the view expressed by the United States Supreme Court.

We are hoping strongly that the prevailing prices will be given proper consideration. The speaker heard some time ago of certain men who were thinking of putting in an electrical power plant, knew where they were going to get their money, and had all their plans made. One of the directors proposed that they see the State Public Utilities Commission and get its views on the subject. They asked the Commission point-blank if, when it came to fixing the rates, they would be allowed a rate of return on the present high cost of production. The answer was in the negative, and the men declined to go ahead with the proposition.